DOCUMENT RESUME

ED 427 569 HE 031 760

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TITLE The Woman Engineering Academic: An Investigation of Departmental and Institutional Environments. ASHE Annual Meeting Paper.
PUB DATE 1998-11-00
NOTE 42p.; Paper presented at the Annual Meeting of the Association for the Study of Higher Education (23rd, Miami, FL, November 5-8, 1998).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Administrator Attitudes; Administrator Behavior; *College Faculty; Collegiality; *Educational Environment; *Engineering Education; *Females; Higher Education; Interpersonal Relationship; Organizational Climate; Professional Education; *Sex Bias; Sex Discrimination; Universities; *Women Faculty; Work Environment
IDENTIFIERS *ASHE Annual Meeting; Faculty Attitudes

ABSTRACT

This study used grounded theory methodology to investigate the institutional and departmental climates of women engineering faculty. Seven female engineering faculty from two universities completed semi-structured interviews that were coded for common themes. All the participants indicated that they had had a natural interest or talent for science and mathematics and had been encouraged by family, teachers, or friends to pursue engineering. The participants also indicated that family considerations and the flexibility afforded by a faculty position influenced their academic career choice. The data revealed that women engineering faculty have made few strides in the academy, and that they continue to encounter barriers which make it difficult for them to survive and succeed, including hostility from male faculty, lack of support from administrators, lack of respect from colleagues, the feeling of being an outsider, and overt sexist behavior. It is concluded that until engineering departments take measures to address these barriers, women engineering faculty will continue to be bombarded by obstacles such as "gendercentrism" and the "outsider" phenomena in the form of micro- and macro-inequities. (Contains 42 references.) (MDM)

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THE WOMAN ENGINEERING ACADEMIC: AN INVESTIGATION OF DEPARTMENTAL AND INSTITUTIONAL ENVIRONMENTS

Sherron D. Benson

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held in Miami, Florida, November 5-8, 1998. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

THE WOMAN ENGINEERING ACADEMIC: AN INVESTIGATION OF DEPARTMENTAL AND INSTITUTIONAL ENVIRONMENTS

Sherron D. Benson

Abstract

This study employs grounded theory methodology to investigate the institutional and departmental climates of women engineering faculty. Given the historical exclusion of women from the engineering disciplines, we must attempt to understand how women who have entered this arena have come to exist in the departmental and institutional environments. Interviews drawing from the professional and personal experiences of the informants were used to develop theoretical constructs that may be applied to future studies. The findings suggest a pattern of "Gendercentricism," and the "Insider/Outsider" phenomena in the form of "micro" and "macro" inequities.

Introduction

The presence of women faculty in academia was virtually non-existent until the onset of non-discriminatory policies such as the Civil Rights Act of 1964 and Title IX legislation of 1972 stipulating the recruitment and hiring of women and people of color (Astin & Snyder, 1982; Finkelstein, 1984; Moore & Sagaria, 1993). Although such legislation has resulted in a moderate increase, women are disproportionately represented in the lower ranks of the professoriate (Finkelstein, 1984; National Center for Education Statistic, 1991). The American Council on Education (ACE) indicated that women hold 45% of the part-time and non-tenure track positions (The Chronicle of Higher Education, 1993). The AAUP's 1988-89 annual report produced disturbing news for women faculty, specifically women of color. The AAUP found that

> "(o)nly 49 percent of female faculty held tenure, compared to 71 percent of male faculty. Though minority women's share of faculty slots grew slightly during the eighties, their chances

> for achieving tenure seemed to be lower than average" (Vandell & Fishbein, 1989, p. 3).

Women of color are distinctly underrepresented given the fact that "only 2 percent of all tenured professorial positions were held by women of color" (The Chronicle of Higher Education, 1993, p. 42). Moreover, women faculty tend to be concentrated in the humanities and social science disciplines (Finkelstein, 1984; Michel, 1988).

The question of "why so few" women in science and engineering is both a past and current issue (Rossi, 1965; Baum, 1989). Traditionally, the "sciences and science-based professions which generally enjoyed high status and rewards, were deemed particularly unsuitable for women . . . on the grounds that women lacked ability, interest, or both" (Horning, 1984, p. 31). It was not until the shortage of "manpower" during World War II that women's participation in science and engineering increased (Petrides, 1996; Reynolds, 1991). However, with the return of WW II veterans, women were forced out of the engineering profession, and their representation in the discipline has remained minimal (Petrides, 1996; Strober, 1992).

Women's non-participation in engineering has greatly affected industry, but specifically academia. Since engineering is still considered a "masculine" discipline, "the stereotypical views of female behavior often interfere with reality when female faculty are interviewed and evaluated. It is often presumed that family responsibilities will interfere with women's professional activities" (Baum, 1989, p. 557). Further, women with Master's degrees who work in industry are not, for the most part, recruited for adjunct positions (Baum, 1989). This

untapped pool of experienced applicants could "serve as role models . . . or [could be tempted] to continue their own education leading to the Ph.D." (p. 557). Hence, the notion that women lack the talent to compete or that their personal lives will interfere with their ability to excel in these areas has lead to qualified women remaining a largely untapped pool of potential engineering faculty (Golladay, 1989).

The deliberate exclusion of women from engineering and the sciences is manifested in our social fabric. According to Horning (1984)

> "(e)ngineering and the sciences have been linked to national security, and therefore to warfare, at least since the siege of Troy. Whether one counts such modern developments such as nuclear weapons, space exploration. . . and defoliants as advances or atavisms, there is no denying that the quest for international one-upmanship has financed much of scientific research, however uneasy that makes most scientists. As a nation we depend heavily on science and engineering for our economic well-being. Together, these two basic functions make science fields of fundamental importance to national life, and many people remain reluctant to leave such matters in the hands of women" (p. 32).

An engineer or scientist wields a degree of status and power that, historically, women have not possessed. Although there have been exceptions to the rule, traditionally such titles have been associated with white males (Aisenberg & Harrington, 1988). Therefore, if the woman engineer or scientist becomes the norm, this "implies a substantial acquisition of new power by women and also a substantial shift in power in the society at large" (Aisenberg & Harrington, 1988, p. 4). Given the mediocre representation of women in the sciences and engineering, one can assess that this belief is intricately woven into the tapestry of society despite organized attempts to dismantle the barriers women

encounter when pursuing a career in these disciplines (Adenika-Morrow, 1996; Hollenshead, et al., 1996; National Research Council; 1991).

Women in engineering endure a "double-bind" (Chapman, 1978; Tobias, 1993) in which they attempt to redefine the image of professor as "male," and are, oftentimes, the lone female surrounded by a cadre of male academics (White, 1989; Baum, 1989). The uniqueness of their problem is due in large part to low representation. Of the seven women engineering faculty interviewed for this study, only two had a female colleague in her area of specialization. In 1986, women comprised less than 5% of the total engineering faculty (National Science Foundation, 1989, p. 574). According to the National Science Foundation and the Science Resources Studies (1991), of the 51% of women academics employed in 1991, only 4.1% were represented in the engineering disciplines. Moreover, in 1992 female representation amongst full-time instructional engineering faculty had slightly risen to 6.1% (Digest of Education Statistic, 1997) despite the number of Ph.D.s awarded to women rising from 6.7% in 1986 to 9.3% in 1992 (NSF, quoted in Wenzel, 1996, p. 8). In essence, the number of women engineering faculty is minuscule when compared to their colleagues in science and mathematics where women represented 20.1% and 27.5% of the full time natural and social sciences faculty in 1992, respectively (Digest of Education Statistics, 1997).

Given the historical and deliberate exclusion of women from the science and engineering disciplines, the focus of this research is to examine the current institutional and departmental climates of women engineering faculty at two

Research universities as well as the networking systems developed for and/or by these individuals. We turn now to the design of the study.

Design of the Study

Conceptual Framework

The environment as well as colleagues' level of acceptance performs an important role in the socialization and adaptation to an organization's culture (Tierney & Bensimon, 1996; Tierney & Rhodes, 1993). The woman engineering faculty is no exception to this rule. A growing body of research critiques the academic environment from a feminist perspective (Aisenberg & Harrington, 1988; Johnsrud and Des Jarlais, 1994; Kelly & Slaughter, 1991; Placier, 1995; Simeone, 1987; Theodore, 1986). However, few research critiques examine women engineers (Baum, 1989; Eden, 1992; Horning, 1984; McIlwee & Robinson 1992; Perrucci, 1968) and even fewer the woman engineering academic (National Science Foundation, 1994; Rosenfeld, 1984; Trautner, Chou, Yates, & Stalnaker, 1996; Wenzel, 1996).

The Setting

The setting for the study are two public institutions, Research I and Doctoral I respectively. As with Research I institutions, the mission is to "achieve national and international prominence for its research and educational contributions" (http://www.research I.edu). According to the Dean's office of the Research I institution, the total number of engineering faculty employed by the institution (including the coordinated engineering program) is 127. Of that number, only 5 are female and the remaining 122 are male. However, in

accessing the departmental websites, a total of 118 faculty were listed, 3.3% female and 96.6% male. A female visiting professor, one of the subjects for this study, was not listed on the department's website.

Beginning the fall of 1997, the Research I institution had only two female engineering faculty--an Industrial Engineering professor at the main campus and the other at an auxiliary branch. Although a previous individual was hired within the same time interval as the professor at the main campus, she left the institution after her first year. In the fall of 1997, three new female professors were recruited--two maintain tenure track positions, one in Computer Engineering Computer Science and the other in Civil Engineering. Also, there is a visiting professor of Electrical Engineering. In addition, the institution employs a female engineer, who is considered faculty, but her duties are primarily staff related; as a result, she was not included in the sample.

Located in a small, family oriented town, the Doctoral I institution is a technological university that is "distinguished for cutting edge research and key technologies" (College Catalogues, 1996/1997). The engineering disciplines are categorized by two umbrella programs: The School of Engineering and The Schools of Mines and Metallurgy. The School of Engineering houses the following departments: Aerospace, Basic, Chemical, Civil, Electrical and Computer, Engineering Management, and Environmental and Mechanical Engineering. Contained within the School of Mines and Mettalurgy are the Ceramic, Geological, Geology and Geophysics, Mettalurgical, Mining, Nuclear, and Petroleum disciplines. Since the School of Engineering comprises the

"traditional" engineering disciplines, the female faculty in these areas were targeted for this study.

According to the institution's website, the School of Engineering has 150 faculty. Of this total, four are women who are tenured or on the tenure-track. In addition, there is a female lecturer in the department of Mechanical and Aerospace Engineering. Two of the women are associate professors of Electrical and Computer Engineering, one is a fifth year assistant professor of Engineering Management (i.e. Industrial Engineering), and the final woman is a first year assistant professor of Mechanical and Aerospace Engineering. Of the five women, three were included in this sample. The first year assistant professor declined to participate in the study for unknown reasons, and the adjunct professor did not return my e-mail or phone calls.

Analysis

For this study, grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1990) provided the method for assessing the institutional and departmental climate of women engineering professors. The grounded theory methodology was first applied in the 1960s by social science researchers. The procedures of grounded theory are the continuous collection of data through interviews, and other documentation (e.g. fieldwork, letters, etc.). In short, grounded theory provides a process by which the researcher can "think about and conceptualize" the data from the participant's world view (Strauss & Corbin, 1990).

The comparative pattern analysis was utilized during the data analysis process where the initial stage was to look for "recurring regularities" or

common themes in the data by developing coding categories (Bogdan & Biklen, 1992; Patton, 1990). According to Bogdan & Biklen (1992), a coding system is developed by searching "through your data for regularities and patterns as well as for topics your data cover, and . . . (writing) down words and phrases to represent these topics and patterns . . . so that the material bearing on a given topic can be physically separated from other data" (p. 166). During this process, codes may be systematically eliminated and/or data may be re-categorized due to "external heterogeneity" (Patton, 1990).

The Informants: How and Why They Chose an Academic Engineering Career?

The informants were chosen by convenience sampling rather than statistical random sampling. I located the subjects by first browsing each department's web site and then telephoning those departments that did have women faculty. I also contacted the Dean's office to verify the final list and to retrieve data on the total number of faculty in the engineering disciplines.

The interview sample ranges in age from late 20's to late 40's. Four of the subjects are assistant professors, two are associate professors, and one is a visiting professor. All of the women are White, with the exception of the visiting professor who is an African American woman. One of the women also revealed that she is a "closeted" Lesbian.

Four of the women had worked in industry prior to receiving their Ph.D. and returning to academia. Many expressed strong parental support and involvement in their career choice. Four specifically stated that their fathers

were engineers or had an engineering background and, as a result, they were "following in dad's footsteps." One assistant professor's

> "father was an Industrial Engineer in the airforce and in junior high he said or they said I should be an Industrial Engineer . . . and my brother is also in engineering, Electrical. And I come from, on my dad side, a long line of engineers. On my mother's side, a lot of school teachers and I was just kinda pushed towards it and it made a good match with my interest."

In their study of women engineers, McIlwee and Robinson (1992) found that 48% of women who had engineer fathers were "more likely to become engineers" (p. 32). They suggest that "girls growing up in these families would be more oriented toward technology, more comfortable dealing with it, and more likely to have had early mechanical experience than women in non-engineer families" (p. 32). This assistant professor of Computer Engineering Computer Science further validates these premises:

> "My brothers both have Ph.D.'s in physics and my undergraduate degree is in physics . . . math and science and engineering was always sort of revered in our household. So, I'm sure that played a big part in that and I think that all of us have a natural talent in math and of course that certainly helps as well."

All of the participants indicated that they had a natural interest or talent in science and mathematics and were also encouraged by either teachers or friends of the family to pursue a career in engineering.

> "I was always good at math . . . friends of my family were engineers and they said have we got a deal for you (laughs) come over here and so it was that simple."

> ". . . When I was in high school I had a math teacher who was very influential and uh recommended that I apply to MIT so I did and I got accepted . . . And of course when you go to MIT everybody's majoring in engineering."

The talent for math and engineering is an important factor for women pursing engineering careers. McIlwee and Robinson (1992) found that 80% of women engineers were "good at math or science." There was only one participant who began as a non-engineering major and decided to pursue engineering "because (she) didn't want a deadline everyday" which is required of journalism majors. One of the associate professors expressed the following:

> "I could always transfer out of engineering if I didn't like it, since it is easier to transfer out than to transfer in."

Essentially, many of the women were encouraged to pursue this non-traditional path once it was discovered that they had a "natural" talent for science and engineering.

One of the key questions asked for this study was "why did they choose an academic career as opposed to a career in industry?" As previously stated, three of the women informed me that they had worked in industry prior to receiving their Ph.D. and returning to the academy. However, it seems that one factor which contributed to their choosing an academic career is family. One third year assistant professor expressed this sentiment:

> ". . . family is very important to me and I figured academia would be a little more flexible versus industry."

The part-time associate professor further validates the importance of family when determining her career choice:

> "It seemed like a very good schedule to have when you have children because your summers are more flexible. You have a long Christmas vacation and so on. So it worked out real well family wise to go into the academic world."

Although their commitment to family dictated their career choice, several researchers suggest that the academy does not understand or is non-responsive to the effects of family responsibilities on women faculty (Hensel, 1991; Finkel & Olswang, 1994).

Many of the participants expressed a tremendous joy in interacting with students. The responses ranged from "I enjoy working with students and I like teaching so academia seemed to be a great place for me" to "I really like teaching and interacting with students" to "I like working with undergraduate students." The majority stated that their greatest accomplishment or most positive experience centered around teaching or students.

> "I absolutely love teaching and I like the accomplishments. You know, like making a difference, when a student comes to my office and say what do I do or they say guess what, I just got a job offer from so and so. Makes my day."

An assistant professor of Computer Engineering Computer Science discussed a successful course she designed. Despite one senior faculty member's protests against her designing the course, it has assisted in the recruitment of graduate students to the department who wish to pursue research with her. Another woman (an assistant professor) had an encounter with a female student (a senior), who commented "about how nice it was to have a woman as a professor finally." It is quite possible such encounters are key to increasing the number of undergraduate females to pursue graduate degrees in engineering, and thus take the role of future women engineering faculty.

These participants' experiences suggest that women engineering faculty possess the necessary skills and talent to succeed in their respective disciplines.

Further, given the shortage of women in this area, their commitment to teaching and students appeared to inspire more young women to pursue an engineering career. However, institutions and departments must give them the support and power to achieve this goal (Trautner, Chou, Yates, & Stalnaker, 1996).

Data Sources

According to Erlandson (1993), personal interviews can provide the researcher with an understanding of the issue from an "interpersonal, social, and cultural aspect" (p. 85). Seven interviews were conducted and each was audiotaped for accuracy and clarity in the analysis process. Notes were taken during each interview and compared against the transcripts for accuracy. The interviews were semi-structured, between 45 minutes to 1 hour in length, and drew upon the participant's professional knowledge and personal experiences.

Findings

The Insider/Outsider Perspective

Within sociology and race relations, the Insider/Outsider phenomenon has received extensive discussion (Becker, 1963; Wilson, 1965; Merton, 1972; Collins, 1986; Rose, 1990). In analyzing the data, the results revealed the Insider/Outsider phenomenon. As Robert Merton (1972) states, the Insider Doctrine purports that

> "you have to be one in order to understand one; one must be one in order to understand what is most worth understanding . . . the doctrine holds that one has monopolistic or privileged access to knowledge, or is wholly excluded from it, by virtue of one's group membership or social position" (p. 15).

The Insider Doctrine is deeply ingrained into the fabric of this subject's departmental environment. She indicated that

> "they are quick to take advantage of the fact that I am not regular faculty and use that every chance they get to diminish what I'm trying to do and what I have done or could do. There are three faculty members who have been very pleasant and very upfront and actually treat me as a peer. The rest of them consider me a glorified graduate student."

Furthermore, the Outsider is not only systematically excluded from the insider's *modus operandi,* they are ". . . no matter how careful and talented is excluded in principle from gaining access to the social and cultural truths" (p. 15). Speaking of her experiences as a woman engineer faculty, she is the first of the four subjects to be recruited to the Research I institution, this female stated that

> "the only time I started feeling like a freak was when I got here and people started pointing out the fact that you know you're the only one and that there are differences. It was interesting to me, you know a lot of things I would tend to just take on that I am not being treated different because of my gender but just because I am new or whatever else. But, it makes me wonder now what was really there."

Although this woman attempted to categorize this treatment because of her status as a "new" professor, she has come to realize that there may be a deeper context based on her status of "non-male" which translates into the Outsider within. This same female described a sense of "floundering" during her first two years as a new professor:

> "The most difficult experience was trying to figure out what my job was, what my responsibilities were and how I should go about pursuing the different aspects. There's no big support structure . . . that I found within the department, within the college at all for new faculty regardless of gender. So, there's like no direction from the department chair, little or no help, unless you go out and seek it from the faculty. So, just figuring out, it took me about

> two years to accept my job, I wouldn't even say I like my job yet but at least I accept it . . . I just finally came to the conclusion that I'm on my own."

The final words of this subject suggest problems in her pursuit of tenure. In essence, the subject did not have anyone "to talk to," and related that if she had had "someone to talk to maybe I wouldn't have had some of the problems to begin with." Her "unsolicited" disassociation from the department places her in a truly volatile situation, especially with regards to the tenure process. As a result of her disassociation from the department, she

> "has neither been socialized in the group nor has engaged in the run of experience that makes up its life, and therefore cannot have the direct, intuitive sensitivity that alone makes emphatic understanding possible. Only through continued socialization in the life of the group can one become fully aware of its symbolism and socially shared realities; only so can one understand the fine-grained meanings of behavior, feelings, and values; . . . unwritten grammar of conduct and the nuances of cultural idiom" (Merton, 1974, p. 15).

According to Merton (1974), the Insider Doctrine is closely aligned to ethnocentricism. Merton quotes Sumner's (1907) definition of ethnocentricism to illustrate this point: "the technical name for (the) view of things in which one's own group is the center of everything, and all others are scaled and rated with reference to it" (p. 32). In short, the Insider claims a "privileged access" that denote the Outsider as "They or Other."

Rose (1990) interprets the concepts "They" and "Us" or "ethnocentric thinking" by employing the poetry of Rudyard Kipling and Robert Louis Stevenson. According to Rose, the literary devices employed by these poets

illustrate denigrating the culture of "They" and overlying the culture of "Us." This abbreviated version of Stevenson's poem clearly illustrates this point:

> *Little Indian, Sioux or Crow,*
> *Little Frosty Eskimo,*
> *Little Turk or Japanese,*
> *Oh! don't you wish that you were me?*
>
> *You have curious things to eat,*
> *I am fed on proper meat;*
> *You must dwell beyond the foam*
> *But I am safe to live at home.*
>
> *Little Indian, Sioux or Crow,*
> *Little Frosty Eskimo,*
> *Little Turk or Japanese,*
> *Oh! don't you wish that you were me?*

The principles of ethnocentricism, as illustrated by Stephenson's poem, are quite applicable to gender construction in American society. The following excerpt, from an unknown source, allegorizes "the confusion between the social and professional" (Sandler, 1986, p. 181) roles of an academic or business women:

> *The family picture is on His desk. Ah, a solid, responsible family man!*
> *The family picture is on Her desk. Um, her family will come before her career.*
> *His desk is cluttered. He's obviously a hard worker and a busy man.*
> *Her desk is cluttered. She's obviously a disorganized scatterbrain.*
> *He's having lunch with the boss. He's on his way up.*
> *She's having lunch with the boss. They must be having an affair.*
> *He's having a baby. He'll need a raise.*
> *She's having a baby. She'll cost the company money in maternity benefits.*
> *He's leaving for a better job. He knows how to recognize a good opportunity.*
> *She's leaving for a better job. Women are not dependable.*

The above illustration is only one example of how professional and ascribed "gender" roles are confused. Further, women may experience either micro-

inequities or macro-inequities. One visiting professor recounted a blatant example of her experiences:

"At the moment, my department is openly hostile."

Thus, the ethnocentricism model may be transformed into "Gendercentricism." Gendercentricism is the incessant proclivity towards overt and/or covert mechanisms of subjugation by an individual or organization on the basis of the "sex" factor or characteristic. I contend that the Insider Doctrine and Gendercentricism operates as a result of two intricately sustainable phenomena: Macro-inequities and Micro-inequities which produces the "Outsider" phenomenon as noted by several of the participants in this study.

The concept micro-inequities, first presented by Mary P. Rowe (1977), is defined as follows:

> ". . . everyday interchanges have been called "micro-inequities" --behaviors that are often so small that they go unnoticed when they occur. Micro-inequities refer collectively to ways in which individuals are either *singled out, or overlooked, ignored, or otherwise discounted* on the basis of unchangeable characteristics such as sex, race, or age" (Sandler, 1986, p. 177).

This seven year veteran recounts a blatant form of Gendercentricism manifested by a micro-inequity:

> ". . . one faculty member was showing some prospective students around the department and he passed me in the hall and he said oh, this is one of our lady professors, you know. And I said, I'm just a professor. You know he should have said well this is one of our professors, but no I'm a ***lady*** (emphasis hers) professor . . . I mean this guy could obviously tell that I was a lady (laughter)."

Her colleague's reference to her as a "lady" professor implies that her being female affects her status as a real professor in the department; therefore, despite

her rise to the rank of associate professor, she nevertheless remains an "Outsider" within.

This assistant professor of Civil Engineering related an incident that created both the "Outsider" phenomenon and the micro-inequity effect.

> "The engineering college has a -- its not an official commencement ceremony because that's the university wide one - but they have . . . a senior recognition convocation . . . The department heads and the deans are up on stage in academic regalia, and then as they have each student come up and get their diploma and shake everybody's hand and walk across the stage and they invite the department's up - faculty and staff - up to stand and shake all the students hands . . . Faculty do not wear academic regalia, you know, first of all I just thought that was really strange (laughs) because its always been a very big deal and you have always assumed that as a faculty member that's one of your obligations. But . . . this idea of going up with the other faculty members and departments (as well as) staff, everyone in that audience, unless they're going to know for certain, are going to assume that I'm a secretary."

This individual notes that it "was really strange" that faculty did not wear academic regalia; however, there was not a tangible need to distinguish the faculty from staff because traditionally the faculty had been entirely male. Therefore, her appearance presents a problem of which only she, as the lone woman, is cognizant.

One associate professor remembers an encounter when she first came to the department:

> ". . . when I first arrived, I was put with an office mate who was uh, (pause) I think he doesn't like the idea of women in this field (laughs). He's the only person I've come across who's been like that. Just very uh, kind of an abrasive person. For a while it was okay and then after a while he was uh got to be pretty rude. And so several months there I was still sharing an office with this guy. He was doing things like not speaking to me for the entire day, even when I said good morning, he wouldn't say

> anything back (laughs) because he had been--he got offended because I had hired a student. A student came to me looking for a summer position and I hired the student . . . apparently this other guy was trying to recruit the student for a summer position and I didn't realize it. He thought I knew it and did it intentionally and so he decided that he was never going to speak to me again. Very immature. So that was probably my most difficult situation was having to share that office space with this man for another several months."

Her office mate's reaction implies that he believed she not only usurped his space, but that she robbed him of resources to which she did not have a valid claim. Her presence was unwanted and he attempted to show her that she was an "Outsider" in the sacred grove by not acknowledging her presence (Aisenberg & Harrington, 1988).

The counterpart of micro-inequities, macro-inequities, may or may not occur as everyday interchanges but are more conspicuous in nature. Thus, a macro-inequity may be defined as abhorrent behaviors that do not go unnoticed--behaviors that relish in the same tenor as a Ku Klux Klan lynching or the Holocaust. A macro-inequity is more apt to receive immediate and focused attention; whereas, the micro-inequity is allowed to manifest itself and is, oftentimes, tolerated or ignored by both the organizational leadership and those who experience it. The visiting professor, an African American female, recounts an incident where she was literally stripped of decision-making privileges:

> "Probably the most difficult (experience) was one that I didn't expect (long pause). My department, prior to my becoming a faculty member had a male visiting professor or instructor from Russia for a year or two. And whether or not he was considered a member of the faculty or treated as a member of the faculty was never an issue. The one time I was late for a faculty meeting, one of my colleagues took the opportunity to decide that they had to vote on whether or not I could vote as a member of the faculty

> that they needed to suddenly develop a policy for visiting professors . . . and with the exception of two of them present, I understand that they voted that I could not vote. And when I got to the meeting they had already done this and nobody mentioned it. Uh, my department chair mentioned it to me as an aside after the meeting because it would be in the minutes of the meeting. But, I found it very telling that we suddenly needed to write a policy for visiting appointments because it was a she and a minority and they never had that policy before. It wasn't an issue with the gentlemen who had been here previously."

Although two of her colleagues had not entertained this idea, the remainder had made a concerted effort to strip her of the power she possessed in the department. The message is quite clear--you are an Outsider--your opinion is not valued and your voice will be muted.

This assistant professor remembers an incident where institutional leadership openly expressed his thoughts at the presence of women on campus:

> "We had a woman of the year banquet (two or three years ago), the first year . . . the Chancellor said, "We have too many women on campus." He then realized from the reaction that he had put his foot in his mouth . . . the only men there were at the head table."

Although the banquet was to honor a woman, every male in attendance occupied the head table. It is quite evident that the power dynamics are unequal, favoring the few males in attendance. This same woman discusses an incident where there is an unbelievable abuse of power:

> "There's been some strange politics, kind of an overthrow of our former department chair . . . Before I got here, S. O. was the first female hired in the School of Engineering. My chair at the time was Turkish, S. O. was Turkish and they had known each other before, the former chair brought her in. She did well, she got tenure. Uh, the way the former chair tells the story, she got lazy and the way other people tell the story, she quit being his underling, lackey or whatever. Uh, they had a major blow up . . . She wanted one year's leave from the school so she could go to California and if she liked it she could resign . . . He said no,

> tried to block that. The Dean and Vice Chancellor got involved and she was given the authorization to go to California . . . the former chair got real mad, in the process of her leaving, he had her arrested because she was packing up a computer, so he called the campus cops and said she was stealing. So, the cops came and took her away and read her her rights."

Given the interplay of cultural and gender factors in this situation, this Turkish female faculty member had crossed those boundaries when she defied the Turkish male department chair. Her rejection of the "underling" role resembles the dissident nature of American women; however, her defiance resulted in a struggle in which she, unfortunately, was a victim of the former chair's abuse of power.

Another informant narrates an experience where she was "given the cold shoulder" by the College of Engineering when she attempted to create a networking system for the women faculty in the college:

> "I called the Dean's office and said . . . do you think you can organize something like this for us, you don't have to foot the bill but if you could just organize it for us to get together once a month or so . . . (In a mocking tone she states the response) Well, we have more important things to do here than to organize a lunch for you and your -- you know. And that was actually one of the things that really derailed me because I had gotten all these really positive . . . we're going to try and help you guys network and foster your development."

Despite the initial setback, the women at the Research I institution were able to successfully organize the network. However, such disappointments, when accumulated, results in the attrition of women faculty, and given their often lonesome journey through the academy, particularly women engineering faculty.

Bernice Sandler (1986) notes that "too often people may relate to women in terms of sexuality rather than as professionals or students" (p. 186).

> "We had a college engineering reception in the fall for . . . faculty and spouses and uh, I was in line and they had a sort of receiving line with the deans and their spouses . . . I dodged out of line to say hello to somebody and walked back up and I had been in front of one of the chairs of another department and said -- oh, you know can I sneak back in line here and he made a comment -- oh, well for such a beautiful woman of course. And you know it's in a work setting -- I just felt that that was not entirely appropriate you know and you sort of feel like well he would never make the equivalent comment to one of his male colleagues."

One assistant professor narrates a classroom incident where she and female students were exposed to explicit and degrading jokes referring to a female's genitalia.

> "the students were to do a project which was setting up, like a business and . . . part of it was doing an oral presentation. (One of the groups) asked to use the computer lab and they had everybody in the class sit at a computer terminal . . . Part of their presentation was going to their web page . . . one of the links was a personal web page, . . . he had links to the playboy page, uh he had quotes . . . stuff that just shouldn't be there."

When she took the jokes to the Vice Chancellor of Student Affairs, his response was "Oh well, Freedom of Speech." Her response was

> "Bull-sh--t, sexual harassment, this made a hostile work environment for myself and female students. This is inappropriate and this is illegal. This cannot be happening!"

According to this informant, the institutions has

> "just implemented a sexual harassment course on the web, requiring students to take it partially because a female professor in Arts & Science resigned and will probably bring legal action against them."

Although the students who constructed the web page had not realized that one of the links was to playboy and apologized to the class, the Vice-Chancellor did not believe he needed to speak to the young men directly. Therefore, he sent them to his female assistant who had only been employed by the institution for three weeks, placing her in an awkward situation. In essence, the leadership in this Doctoral I institution displayed a naive and apathetic attitude towards creating a non-hostile working environment for women faculty and students.

Women often must contend with being addressed by "social terms such as *"sweetie," "dear," "Mrs." or "young lady"*--words which undercut a woman's professional identity--especially if her male colleagues are being addressed as "Dr." (Sandler, 1986, p. 186). The experiences these women encountered reveal the extent to which micro-inequities have been allowed to seep into the core of academia:

> "I know there is just a lack of understanding . . . students, I don't know if it's because they don't see enough women in the classroom, will tend to address me and some other people I talk to as Mrs. W. or Ms. W. and they leave off the title Dr. where they don't do the same with the men so there its assume they're a Dr. . . I remember I asked a student once because they were doing the EIT Review Sessions so it had Dr. C. is doing this and Dr. so and so is doing this session and Mrs. W. is doing this. So, they had it up there with a list of Drs. and I asked him why was I Mrs.? He didn't have an answer, so I don't know why they don't afford the title. But, on a listserve just among faculty in general, that issue has come up and it was the women that said yes it makes a difference and the men saying oh it shouldn't matter and I don't know that they understand, if they would feel the same way if it was happening to them."
>
> I get mistaken for being a secretary all the time. Uh, or you know people will introduce me or call me Mrs. C. as opposed to Professor C. or Dr. C. Uh, you know so those are just little

> annoyances, they're not really what I would say impediments to my professional progress, but you know I wish they weren't there."

Researchers such as Stanley and Wise (1983) argue for an approach where the mundane, everyday, taken-for-granted experiences of women are considered when analyzing their existence. These everyday experiences often send the signal of acceptance or non-acceptance by one's colleagues. One participant explains this dilemma:

> "I think they want to be accepting and so to a certain degree they are accepting, but I don't know if they are aware of the difficulties faced by women in engineering. Just being one of a different gender and the minority on most campuses. So, I don't think they thought of the different issues such as parenting . . . I think you get stepped on a little bit more, just cause they're unaware . . . maybe they want to be (aware) they just don't know how to quite get there yet."

These micro-inequities or unawareness on the part of male colleagues and superiors ". . . help to perpetuate female subordination . . ." (Statham, et al., 1991, p. 13). Thus, Stanley and Wise argue that "changes must address this sphere" or the subjugation will continue its ceaseless cycle (p. 13).

This associate professor recounts an experience in which her colleague made a, what she refers to, "typical male" comment:

> ". . . we were interviewing for a chaired position in Computer Engineering. Uh, a woman faculty candidate from another school and she and I were actually in my office talking about various things. You know it was an interview and we were running late and she'd come to my office late, so we were running late. And, one of the faculty--and unfortunately it was kind of funny because she was asking me about the female climate in our department--and I was telling her oh no everything here is great, wonderful, you know, one big happy family kind of stuff. And then one of the other faculty members who was waiting for her for lunch came up to my office to find out where she was and made some

> off hand comment about two women *gabbing* (emphasis mine) together or something like that. You know I just felt really embarrassed . . . And this was you know nothing--you know really nothing bad, it was just one of those off hand comments . . . I'm sure he regretted it once he said it, uh but its just one of those kind of natural things that you know that some of the older men tend to do."

This same woman related another incident where she was thought to be a colleague's secretary:

> "Just even a week ago, one of my colleagues was walking and he and I were working on a research project together and he was walking in the hallway with a faculty member from a different department . . . So I came up to him and talked to him . . . this other colleague said to my colleague you know something about how his secretary interacted with him or something like that . . . I think they both handled it very well because my colleague said, no no, this is--you know I'm a professor, I'm working with him and then this other guy did apologize, he felt bad about making that assumption."

Just as the academy has allowed micro-inequities to manifest within departmental and institutional climates, this woman has resorted to "making excuses" for her colleagues behavior. There appears to be an unconscious tenor of "boys will be boys" lingering in her words that may indicate she has accepted this behavior.

Unlike their colleagues in the humanities, social sciences, and even the sciences, women engineering faculty can "stick out like a soar thumb," particularly when meeting in public places. This assistant professor discusses the reaction from male colleagues when women faculty first established monthly luncheons:

> "When they first started the group, they would go out of town for lunch because enough disparaging comments were made that they were scared to see women together and there were times that they

> would joke--males would see three or four of us at lunch and say "Oh, are y'all plotting an overthrow?" . . . They can't understand why we are together and they're scared sh--tless when we are."

This assistant professor has realized

> "that at engineering functions, I tend to end up standing around and talking with them (female colleagues) and I need to make an effort--we need to make an effort not to do that because there also tends to be the perception you see a couple of male faculty members off talking together nobody thinks twice about it--largely because there are so many of them, but if you see the four female faculty members everybody goes oh what are they talking about."

The proverb, "there is power in numbers" is significant with respect to women engineering academics. Since engineering is one of the last of the "masculine" disciplines in which women have gained entry, there is an obvious phobia towards these women from their male colleagues. If women engineering faculty were to increase their numbers significantly, men would be forced to confront their biased, sexist, stereotypical perceptions.

In her examination of gender equity in higher education in terms of the balance between career and family, Hensel (1991) contends that despite acquiring "equal educational backgrounds and equal access guaranteed by law . . . women did not anticipate the intensity of the conflict between work and family when they began seeking career status equal to that of men" (p. 43). According to Finkel and Olswang (1994), the conflict between family and career has deep historical roots because the traditional role of women is wife and mother. Thus, when women began to take on non-traditional roles, such as professors, they found themselves in awkward positions. Further analysis of the status of women faculty confirms that not only were women unaware of the conflict

between family and career, but that higher education institutions failed to address the impact of family responsibilities on the lives of academic women. According to this fifth year assistant professor, the women thought that they would finally get day care services after the Vice Chancellor's wife had a child. However, this was, as she said, "no big deal because they were able to hire a live-in nanny." In essence, "when it seems like opportunity for improvement there isn't any." Her colleague, at this institution, expressed the sentiment that

> "probably the most difficult thing really hasn't had to do with uh, my job per say. It's been day care . . . I am a working mother . . . there are a lot of times that we are asked to do things over the evening and weekends and to travel extensively and uh, you know that's very difficult for me to find an even balance."

Although she believes that the lack of day care is not directly related to her job, she does realize the impact it could have if she and her husband were unable to "afford good day care." Nonetheless, there are women faculty who cannot afford or find quality child-care near their work environment (Hensel, 1991). These individuals remain hopelessly caught between providing their children with a nurturing environment and work responsibilities.

This third year assistant professor discussed her situation as the first pregnant tenure-track professor in the College of Engineering:

> "Other universities have gone through it--it will be interesting to see because I still can't get them--it's convenient that this baby is coming after the semester and during the summer so that they don't have to deal with what would happen if it were mid-semester would I get six weeks to recover or would I not, who would teach the classes? So that might be an issue when the next baby comes along . . . I think they are going to have to deal with that one issue but trying to make them realize that they have to address it . . . out in industry you can have your babies whenever you want to have your babies (laughs) and you get maternity

leave . . . its worked out."

Hensel (1991) addresses the stress placed on women academics when attempting to plan the ideal time for conceiving a child. Although this assistant professor states that "family is more important to me," how will this affect her professional career? In her words, "it would be interesting to see how this comes out."

An associate professor explains that her male colleagues do not understand the responsibilities of the woman academic, she recalls instances where she was not able to take advantage of professional roles.

> " . . . there's always you know when one of the children is ill or something like that. And for me primarily its been travel. I've had a couple of instances where I have been invited to go over seas and I just say no--I won't do that. Uh, whether that has impacted my professional career--I don't know--its hard to say . . . You know I just think sometimes a lot of the men in the department, since engineering tends to be very traditional, a lot of men here uh are older, you know where they have wives who stayed at home and uh took care of their children such that they were able to put in 15 hour days if they needed to, would work on the weekends, or travel extensively. They sometimes don't appreciate uh a lot of the juggling that's required, but I can't say, I can't point to it and say well this [has] caused a problem or not because I don't think it has. But, it's just something that I don't think there is a lot of--level of appreciation for."

The experiences of women engineering faculty are not unique but have more impact because of their low representation. Most of the women are in an environment that does not consider the problems and issues they encounter. Some are constantly, as is the case with this first year assistant professor,

> ". . . trying to figure out which battles are worth fighting . . . When do you just say okay, I know it wasn't meant in an offensive way or you know the person just didn't think before he or she said it. So when is it worth saying something and when is it better to just bite your tongue and go okay, we'll just let this one roll . . . because you don't want to waste this energy on things."

Although "universities discourage most of the more obvious forms of discrimination against women" (Horning, 1984, p. 41), women, such as this subject, are forced to contend with the micro-inequities because the battle may be too small to fight. However, regardless how seemingly insignificant the inequity may be, this woman, nor others who find themselves "picking and choosing their battles" should not be compelled to endure such subjugation.

The Contextual/Woman Centered Perspective

This perspective considers two theoretical components. First, the premise of the contextual perspective, as quoted in Statham, et al. (1991), is that gender must be reconceptualized where it is "viewed as a "variable variable" and not a set of rigid traits and behaviors inherent in the individual (cf. Broverman et al. 1970)" (p. 11). The contextual perspective asserts that " (o)ne behaves differently according to the specific demands of the situation . . . gender is regarded as a continuously constructed social identity (Gerson and Piess 1985) that can be separated from sex both conceptually and empirically" (p. 11).

This visiting assistant professor describes how she confronts a problem she may encounter which might be characterized as a masculine response:

> "My response is I tend to be more in your face . . . I've never been accused of being shy. I'm a very vocal person. I'm a very opinionated person . . . so that sort of tends to be my response to say okay if that's what you think, let me show you what else I've got."

Although this assistant professor was aware of the possible repercussions for writing letters to the local newspaper defending homosexuality, she forged ahead and sent letters under her own name. She also sits on

> "the academic council which is our faculty senate and had issues that I voiced out and (had) approved."

Given the fact that gender is a social construction and sex is a biological product, conventional "feminine" characteristics may be displayed by men just as traditional "masculine" characteristics may be employed by women when in certain situations as exhibited by the above informants (Statham, et al., 1991). Unlike the visiting professor and the assistant professor previously mentioned, this associate professor has decided to take a less volatile approach when encountering male colleagues:

> "I have tried to steer clear of being known as a militant woman . . . I don't think its for me anyway politically a good idea for me to be known as a militant female. My feeling on this is that it's far better to just be a good role model than to be militant because then people--I personally feel that people will accept me more smoothly and appreciate me and my contributions rather than if I take the in your face kind of approach. They kind of then get ruffled up and immediately don't like you. Rather or not you deserve it."

Unfortunately, this woman believes that if she serves as the "faculty advisor for the society of women engineers or . . . get very involved in some of the minority engineering programs" she will be an "Outsider" within her department. Rather, this associate professor has played by the established rules of the white male social structure that has resulted in her recognition via "a couple of faculty excellence awards."

One assistant professor revealed that there are different coping strategies for women engineering faculty. She compares her strategy to her female engineering colleagues:

> "M.C. puts blinders on , cranks down and works her but off . . . she doesn't deal with this. She is in the lab, she is working hard. N.H.'s coping strategy is more I got my family, my children are here, my parents are here. Uh, cut back once she got tenure and isn't playing the game and isn't fighting the fight and is kind of playing by her own rules now that she's got tenure. N.M. is following M.C.'s approach. My approach was attack windmill and bang your head against the wall and last year I kind of let go, this isn't doing any good, this isn't any fun. So that's kind of how people have coped."

This assistant professor reveals that

> "a lot of times, and again I don't know if its gender related or just myself, you tend to internalize the problem and say its your fault for not asking the right questions or not knowing what to do and then you just let go."

Given the absence of empirical studies examining the institutional and departmental climates and networking systems of women engineering faculty, the application of a woman's centered perspective is important. The woman-centered perspective takes into account a number of theoretical approaches. A case in point would be analyzing the strategies and styles women employ to solve problems as not deviant from men but as credible in their own right (Belenkey et al., 1986; Eichler, 1980; Fishman, 1978; Gilligan, 1982; Statham et al., 1991). To illustrate, for some of the women, the networking systems formed at institutional and departmental levels have kept them "sane and sober" and give them the opportunity to "talk with people who are not hostile and who have you know some of the same interests and same problems that you do." Primarily, the networks serve a social function, but the women are also "sounding boards" for each other, providing much needed advice. An assistant professor stated that she tends to "talk to other colleagues around campus about

(a problem). I met a number of other brand new assistant professors fresh out of school in other departments around campus and we've developed this sort of network and so I'll talk to them about it." This woman tends to consult the advice of her colleagues, a form of strategizing that is centered around building relationships and attachments to others (Gilligan, 1982).

Despite the networks serving a tangible purpose for some women, others "don't really put a lot of uh credence in those kinds of networks because typically I think men feel very threatened when women get together." An assistant professor stated that "frankly I have better things that I need to spend my time doing." However, she does admit that she makes "friends with people who do . . . know what's going on . . . I guess that is how its (the network) assisted me."

The Exception to the Rule

Although 6 of the participants encountered problems exhibiting micro-inequities and or macro-inequities, one assistant professor of Computer Engineering Computer Science stated "I have certainly never gotten any feelings or attitudes from other professors that I am not as accepted as the men." She continues:

> "I think the academic scene has a lot of competitive factors to it in terms of things like publications, and students, and money that you bring in and all those sort of factors that I think that you are accepted based on those things not whether you're a man or woman or some sort of superficial on the surface type of criteria."

Despite her beliefs, she does note that maybe she has become "desensitized in some sense" because she has always worked in a male-dominated environment.

It is quite possible that she has been socialized by the male-dominated paradigm; however, her departmental environment could also be very supportive.

The visiting assistant professor speaks about this assistant professor's departmental chair that introduced himself. This department chair is "always wandering around talking with his faculty" and inquiring about their needs. Furthermore, he introduced the visiting professor "to other members of his department that he thought (she) might be interested in doing some research with." Unlike the Computer Engineering Computer Science department chair, the visiting professor of Electrical Engineering relates that her department chair is ". . . very uncomfortable speaking to me. He sits in his office, he sends e-mail. He doesn't want to deal with confrontation. He doesn't like to deal with me." Apparently, the department chair controls the dynamics and climate of the department, and thus possess the power to perpetuate or eliminate micro and macro-inequities.

Given that engineering and the science disciplines are male-dominated these academic cultures are steeped in "male-dominated repertoires of knowledge, research methods, behaviors, attitudes, and values" (Moore & Sagaria, 1991, pg. 227). In order to understand the departmental and institutional climate relative to women engineering faculty, it is necessary to emphasize how the participants have come to perceive and exist in the organization (Bogdan & Biklin, 1992). Therefore, the theoretical underpinnings for this data are derived from the participant's reflections on their experiences and perceptions of their departmental and institutional environments. The individuals' "talk" revealed a

number of themes in which not only the feminist perspective but sociological/racial constructs emerged as well.

Recommendations

Perhaps one of the informants sums it up best:

> "the lack of awareness is an issue, I don't know how to make it an issue . . . what you really need to do is just transplant them for about a month to somebody else's body to experience the differences . . . because they have never been a victim of harassment and or discrimination because they're all, majority protestant white males, affluent, . . . they haven't experience what a lot of people do. They have no clue as far as women's issues."

Although raising awareness cannot be realistically achieved by this technique, this woman and the others offered tangible recommendations for improving departmental and campus climates for women engineering academics. The participants revealed the need for structured mechanisms to support women faculty and to eliminate micro and macro-inequities. This assistant professor believes that there is a great need to diversify the campus. She states that

> "we don't have the benefit of . . . a women's studies program. We would have to sedate them if we did because they just couldn't take it here. So we're single-focused, we don't have any new blood, we don't have any new perspective, we don't have any diversity on faculty. Our Chancellor has been at this university since the 60's, he started as an assistant professor and never left. Our Associate Dean graduated from the institution right after WWII. He's really old, he's been here forever. They do bring in a little bit of new blood but not enough to make a difference."

Essentially, new blood means expanding the academic curriculum which would result in "diversifying the faculty and administration." If this were done, the level of awareness and sensitivity to not only women but minority issues would substantially increase.

The women also recommended the following formal and informal actions and policies to improve institutional and departmental climates:

*The Dean should visit faculty meetings periodically in order to assess the departmental dynamics.

*Create a listserve or discussion group that could foster dialogue among women faculty to discern how others deal with some of the differences, what are some of the problems specific to women in engineering and the sciences.

*Create sensitivity classes to make males aware of the differences because it impacts them in not only working with their colleagues but with students in the classroom.

*Provide a formal setting where women across campus can interact (possibly a monthly seminar series or luncheon).

* Provide day care services.

*Increase the number of women in engineering.

The women also indicated that on an individual basis, female professors should create informal contacts, join organizations, or connect with organizations of which they are members. According to them, informal networks and organizational memberships are excellent sources for retrieving information vital to one's success in the academy.

Conclusions and Implications

Fundamentally, the premise of woman-centered theory is that women have been defined by and confined to theoretical perspectives based on the perceptions and experiences of their male counterparts. Given the fact that empirical studies examining the experiences of women engineering faculty are virtually non-existent, it is imperative that a womanist perspective is employed in order to broaden the analysis and interpretation of data.

The data reveals that women engineering faculty have made few strides in the academy, and they continue to encounter barriers, which makes it difficult for them to survive and succeed. Essentially, the institution and departments are not responding to the unique problems these individuals encounter. These women have been recruited to the institution, but they have not been given the necessary assistance to get them "off and running" in the tenure race. Women faculty should not blame themselves for "not asking the right questions or not knowing what to do" when confronted by problems in the academy. Further, women engineering faculty should not have to encounter a single individual-colleague or administrator-who openly scorns the presence of women in the discipline. Encountering one individual of this type is one too many and could be the difference between a woman engineering faculty leaving or remaining in the professorate. Therefore, the institution must re-examine the environments of the engineering departments considering questions such as: Are women faculty isolated from their male colleagues? Is the department chair creating an environment where all faculty are given the potential to succeed? Are women asked to do excessive service for the institution? What are strategies that the institution, college, and department can employ to remedy the problems women engineering faculty encounter? Until institutions begin to ask these and similar questions, and produce solutions, the plight of women engineering faculty will continue to be bombarded by obstacles such as Gendercentricism and the "Outsider" phenomena in the form of micro and macro-inequities.

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